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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/819,114	03/27/2001	Chris A. McGibbon	MGW-002	4315

959 7590 03/21/2005

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EXAMINER	
KIM, CHONG R	

ART UNIT	PAPER NUMBER
2623	

DATE MAILED: 03/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/819,114	MCGIBBON ET AL.	
	Examiner	Art Unit	
	Charles Kim	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 October 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *4-48 and 50-80* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *4-48 and 50-80* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 March 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment and Arguments

1. Applicant's amendment filed on October 13, 2004 has been entered and made of record.

2. In view of applicant's amendment, the claim objections due to typographical errors are withdrawn.

3. Applicant's arguments have been fully considered, but they are not deemed to be persuasive for at least the following reasons.

Applicants argue (pages 17-18) that their claimed invention (claims 4, 6, 25, 54, 67) differs from the prior art because "Handelman teaches away from the acquisition of kinematic data as taught by Kunii and Nesbit...Handelman focuses on the creation of kinematic data rather than the acquisition of kinematic data as taught by Kunii and Nesbit...therefore, there is no motivation or suggestion to combine Kunii and Nesbit with Handelman." The Examiner disagrees. Handelman clearly discloses (col. 26, lines 40-60) that his system can be integrated with key framing--the acquisition of kinematic data as taught by Kunii and Nesbit. Handelman explains that this integration allows a model to exhibit the characteristics of the recorded motion using key frame, while exhibiting fully interactive behaviors, thereby enhancing the flexibility of the kinematic/kinetic analysis system (col. 29, lines 31-38). Furthermore, the Examiner notes that Handelman is not relied upon to teach the "acquisition of kinematic data". Kunii discloses the step of acquiring the kinematic data (col. 3, lines 20-39). Handelman is relied upon to teach the use of quaternions to describe the position and orientation of a body segment. In response to the Applicant's argument that there is no motivation or suggestion to combine the references, the

Examiner responds by pointing out that the suggestion/motivation to combine Kunii and Nesbit with Handelman would have been to increase the flexibility of the kinematic/kinetic modeling system, while enhancing the appearance of model movement.

Applicants indicate (page 20) a traversal of the Official Notice taken by the Examiner in regards to computers performing time differentiation and integration on data being well known. In response, the Examiner relies on Radow, U.S. Patent No. 6,454679 to provide support for this assertion. For instance, Radow discloses a computer processor that performs time differentiation and integration on data in col. 35, lines 10-26.

Applicants further indicate (page 21) a traversal of the Official Notice taken by the Examiner in regards to computers performing digital filtering and Fourier transforms on data being well known. In response, the Examiner relies on Plotke, U.S. Patent No. 5,329,368 to provide support for this assertion. For instance, Plotke discloses a processor that performs digital filtering and Fourier transforms on data in col. 2, lines 54-59.

Applicants further indicate (page 21) a traversal of the Official Notice taken by the Examiner in regards to zooming a plot being well known. In response, the Examiner relies on Ueda et al., U.S. Patent No. 4,845,764 to provide support for this assertion. For instance, Ueda discloses zooming a plot in col. 6, lines 18-31 and figures 5b, 6.

NOTE: Applicants indicate (page 13) that claim 26 has been cancelled. However, on page 5 of the marked-up claims, it appears that claim 26 is still pending. Accordingly, claim 26 is considered pending.

Claim Objections

The following quotation of 37 CFR § 1.75 (d)(1) is the basis of objection:

> (d)(1) The claim or claims must conform to the invention as set forth in the remainder of the specification and the terms and phrases used in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description. (See § 1.58(a)).

4. Claims 54-80 are objected to under 37 CFR § 1.75 (d)(1) as failing to particularly point out and distinctly claim the subject matter which the applicant regards as his invention or discovery.

Referring to claim 54, the phrase "the at least one cluster of markers" in line 6 lacks antecedent basis. It appears that the applicant intended the phrase to read "at least one cluster of markers". A similar objection is applicable to claim 67. Appropriate correction is required.

Referring to claim 54, the phrase "said configuration data" in lines 11 and 13 lack antecedent basis. It appears that the applicant intended the phrase to read "configuration data". A similar objection is applicable to claim 67. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 4, 15-18, 22-26, 35-38, 42-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Kunii et al., U.S. Patent No. 5,625,577 ("Kunii") and Handelman et al., U.S. Patent No. 6,057,859 ("Handelman").

Referring to claim 4, Kunii discloses a method for modeling a subject to obtain kinematic and kinetic data, the method comprising the steps of:

a. representing the subject by at least one body segment (col. 3, lines 5-13)

b. obtaining image device data from at least two image devices of the at least one body segment captured by the image devices at more than one time (col. 3, lines 20-39)

c. transforming the image device data into configuration data describing the position and orientation of each of the at least one body segment (col. 3, lines 23-27)

d. processing the configuration data to obtain kinematic and kinetic data about the subject (col. 3, lines 40-43).

Kunii does not explicitly disclose that quaternions are utilized to describe position and orientation of each of the at least one body segment. However, this feature was exceedingly well known in the art. For example, Handelman discloses quaternions that are utilized to describe position and orientation of at least one body segment (col. 21, lines 13-20).

Kunii and Handelman are combinable because they are both concerned with determining kinematic and kinetic data of a human subject. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the transforming step of Kunii so that quaternions are utilized to describe position and orientation of each of the at least one body segment, as taught by Handelman. The suggestion/motivation for doing so would have been to compute kinematic problems in real time, while producing human limb movements that appear

natural and realistic to the viewer (Handelman, col. 3, lines 24-35). Therefore, it would have been obvious to combine Kunii with Handelman to obtain the invention as specified in claim 4.

Referring to claim 15, Kunii further discloses that the kinematic data include information regarding motion of the subject (col. 3, lines 40-42), and kinetic data include information regarding at least one torque and a force on the at least one body segment of the subject (col. 3, line 66-col. 4, line 13).

Referring to claim 16, Kunii further discloses that the kinetic data include information regarding at least one torque and a force exerted at the neck of the subject (col. 4, lines 54-55).

Referring to claim 17, Kunii further discloses that the kinetic data include information regarding at least one torque and a force exerted at the ankle, knee, and hip of the subject (col. 4, lines 54-55).

Referring to claim 18, Kunii further discloses that the force includes a force exerted on the subject by a floor (col. 4, lines 56-59).

Referring to claim 22, Kunii further discloses that the kinematic data include information regarding the head, arms, trunk, and pelvis of the subject for determining the upper body mobility of the subject (col. 8, lines 10-27).

Referring to claim 23, Kunii further discloses that the kinematic data include information regarding the feet, shanks, and thighs of the subject for determining the lower body mobility of the subject (col. 8, lines 10-27).

Referring to claim 24, Kunii further discloses the step of calculating the center of mass of the subject (col. 7, lines 27-31).

Referring to claim 25, see the rejection of at least claim 4 above.

Referring to claim 26, Kunii further discloses at least one cluster of markers for each of the at least one body segment to obtain the image device data (figure 2).

Referring to claim 35, see the rejection of at least claim 15 above.

Referring to claim 36, see the rejection of at least claim 16 above.

Referring to claim 37, see the rejection of at least claim 17 above.

Referring to claim 38, see the rejection of at least claim 18 above.

Referring to claim 42, see the rejection of at least claim 22 above.

Referring to claim 43, see the rejection of at least claim 23 above.

Referring to claim 44, see the rejection of at least claim 24 above.

6. Claims 5-9, 11-14, 19, 27-29, 31-34, 39, 57-59, 61-66, 71-77 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Kunii et al., U.S. Patent No. 5,625,577 ("Kunii"), Handelman et al., U.S. Patent No. 6,057,859 ("Handelman"), and Nesbit et al., U.S. Patent No. 5,772,522 ("Nesbit").

Referring to claim 5, Kunii further discloses the steps of:

e. assigning at least one cluster of markers to each of the at least one body segment (figure 2)

f. transforming the image device data into position coordinates of the markers (col. 7, lines 1-19).

Kunii and Handelman do not disclose expressly that the image device data is transformed into three dimensional position coordinates of the markers. However, this feature was exceedingly well known in the art. For example, Nesbit discloses the steps of assigning at least

one cluster of markers to each of at least one body segment (col. 4, lines 47-51), transforming image device data into three dimensional position coordinates of the markers (col. 7, lines 48-61), processing the three dimensional position coordinates to obtain the position and orientation of each of the at least one cluster, thereby determining the position and orientation of each of the at least one body segment (col. 5, line 66-col. 6, line 9, and col. 7, line 41-col. 8, line 45).

Kunii, Handelman, and Nesbit are combinable because they are all concerned with determining kinematic and kinetic data of a human subject. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the position coordinates of Kunii and Handelman so that they are transformed into three dimensional position coordinates, as taught by Nesbit. The suggestion/motivation for doing so would have been to realistically display the motions of the subject using smooth three dimensional modeling pictures rather than line drawings (Kunii, col. 12, lines 36-39). Therefore, it would have been obvious to combine Kunii and Handelman with Nesbit to obtain the invention as specified in claim 5.

Referring to claim 6, Handelman discloses that quaternions are utilized to determine the position and orientation of each of at least one body segment (col. 21, lines 13-20). As noted above (claim 5), Kunii discloses the step of assigning at least one cluster of markers to each of the at least one body segment. Accordingly, the combination of Kunii and Handelman disclose that quaternions are utilized to determine the position and orientation of each of the at least one cluster.

Referring to claim 7, Nesbit further discloses the step of transforming the image device data into position and orientation data of the at least one cluster of markers (col. 5, line 66-col. 6, line 9, and col. 7, line 41-col. 8, line 45), and transforming the position and orientation data of

the at least one cluster of markers into position and orientation data of the at least one body segment [col. 5, line 66-col. 6, line 9, and col. 7, line 41-col. 8, line 45. Note that the transformed data representing position and orientation data of the at least one cluster of markers will include the transformed data representing position and orientation data of the at least one body segment, since the cluster of markers define the body segment (col. 6, lines 3-9)].

Referring to claim 8, Nesbit further discloses that the position and orientation data of the at least one body segment is initially determined by a pointer (golf club) [col. 8, lines 60-62].

Referring to claim 9, Nesbit further discloses that the pointer includes a set of markers on a rigid plate (col. 6, lines 7-9).

Referring to claim 11, Nesbit further discloses the step of utilizing antropometric data (weight and height) of a subject to calculate inertial properties of at least one body segment (col. 1, lines 59-67).

Referring to claim 12, Nesbit does not disclose expressly that the inertial properties include the mass of each body segment of the subject.

Kunii discloses the step of calculating inertial properties that include the mass of each body segment of the subject (col. 3, lines 18-20). Therefore, it would have been obvious to combine the teachings of Kunii and Nesbit for the reasons stated above (claim 5).

Referring to claim 13, Kunii further discloses that the inertial properties include the center of mass of each of the body segment of the subject (col. 3, lines 18-20).

Referring to claim 14, Kunii further discloses that the inertial properties include the moment of inertia of each of the body segment of the subject (col. 9, lines 25-55).

Referring to claim 19, Kunii and Handelman do not disclose expressly that a power profile and energy expenditure for upper and lower body segments and joints are computed.

Nesbit discloses the step of computing a power profile and energy expenditure for upper and lower body segments and joints (col. 11, lines 62-67 and col. 12, lines 42-48).

Kunii, Handelman, and Nesbit are combinable because they are all concerned with determining kinematic and kinetic data of a human subject. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify Kunii and Handelman's step of processing to include the teachings of Nesbit. The suggestion/motivation for doing so would have been to realistically display the motions of the subject using smooth three dimensional modeling pictures rather than line drawings (Kunii, col. 12, lines 36-39). Therefore, it would have been obvious to combine Kunii and Handelman with Nesbit to obtain the invention as specified in claim 19.

Referring to claim 27, see the rejection of at least claim 7 above.

Referring to claim 28, see the rejection of at least claim 8 above.

Referring to claim 29, see the rejection of at least claim 9 above.

Referring to claim 31, see the rejection of at least claim 11 above.

Referring to claim 32, see the rejection of at least claim 12 above.

Referring to claim 33, see the rejection of at least claim 13 above.

Referring to claim 34, see the rejection of at least claim 14 above.

Referring to claim 39, see the rejection of at least claim 19 above.

Referring to claim 57, Nesbit and Handelman do not explicitly disclose that the kinetic analysis module determines the torque and force exerted at the neck, shoulder, or lower-back

regions of the subject. However, this feature was exceedingly well known in the art. For example, Kunii discloses a kinetic analysis module that determines torque and a force exerted at the neck of the subject (col. 4, lines 54-55).

Nesbit, Handelman, and Kunii are combinable because they are all concerned with determining kinematic and kinetic data of a human subject. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the kinetic analysis module of Nesbit and Handelman so that it determines the torque and force exerted at the neck, shoulder, or lower-back regions of the subject, as taught by Kunii. The suggestion/motivation for doing so would have been to enhance the flexibility of the kinetic/kinematic analysis system. Therefore, it would have been obvious to combine Nesbit and Handelman with Kunii to obtain the invention as specified in claim 57.

Referring to claim 58, see the discussion of at least claim 18 above.

Referring to claim 59, Nesbit further discloses the step of computing a power profile and energy expenditure for upper and lower body segments and joints (col. 11, lines 62-67 and col. 12, lines 42-48).

Referring to claim 61, see the discussion of at least claim 22 above.

Referring to claim 62, see the discussion of at least claim 23 above.

Referring to claim 63, see the discussion of at least claim 24 above.

Referring to claims 64-66, see the discussion of at least claim 45 below.

Referring to claim 71, see the rejection of at least claim 57 above.

Referring to claim 72, see the rejection of at least claim 58 above.

Referring to claim 73, see the rejection of at least claim 59 above.

Referring to claim 75, see the rejection of at least claim 61 above.

Referring to claim 76, see the rejection of at least claim 62 above.

Referring to claim 77, see the rejection of at least claim 63 above.

7. Claims 10, 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Kunii et al., U.S. Patent No. 5,625,577 ("Kunii"), Handelman et al., U.S. Patent No. 6,057,859 ("Handelman"), Nesbit et al., U.S. Patent No. 5,772,522 ("Nesbit"), and the applicant's admitted prior art ("Admission").

Referring to claim 10, Kunii, Handelman, and Nesbit do not expressly disclose the step of computing motion data by using a Rodrigues vector method to determine joint centers of rotation of at least one body segment.

Admission discloses a step of computing motion data by using a Rodrigues vector method to determine joint centers of rotation of at least one body segment (page 8, lines 13-14).

Kunii, Handelman, Nesbit, and Admission are combinable because they are all concerned with determining kinematic and kinetic data of a human subject. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify transforming step of Kunii, Handelman, and Nesbit, so that a Rodrigues vector method is used to determine joint centers of rotation of at least one body segment, as taught by Admission. The suggestion/motivation for doing so would have been to accurately determine the joint centers of rotation. Therefore, it would have been obvious to combine Kunii, Handelman, and Nesbit with Admission to obtain the invention as specified in claim 10.

Referring to claim 30, see the rejection of at least claim 10 above.

8. Claims 20, 21, 40, 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Kunii et al., U.S. Patent No. 5,625,577 ("Kunii"), Handelman et al., U.S. Patent No. 6,057,859 ("Handelman"), and the text book entitled "FUNDAMENTALS OF PHYSICS" by Halliday et al. ("Halliday").

Referring to claims 20 and 21, Kunii further discloses that Newton's equations are used to calculate motion and force parameters for each segment of the body (col. 9, lines 25-55). However, Kunii and Handelman do not disclose expressly that the linear and angular momenta associated with the head, arm, trunk, foot, shank, thigh, and pelvis of the subject are computed.

Halliday discloses that the linear and angular momenta were commonly known mathematical expressions based on Newton's equations that represent the force and motion of an object (page 278-279, section 12-5).

Kunii, Handelman, and Halliday are combinable because they are both concerned with determining kinematic and kinetic data of an object. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the processing step of Kunii and Handelman, so that the linear and angular momenta associated with the head, arm, trunk, foot, shank, thigh, and pelvis of the subject are computed, as taught by Halliday. The suggestion/motivation for doing so would have been to provide additional kinematic/kinetic information corresponding to the object such that an accurate motion analysis can be obtained (Kunii, col. 5, lines 17-22). Therefore, it would have been obvious to combine Kunii and Handelman with Halliday to obtain the invention as specified in claims 20 and 21.

Referring to claim 40, see the rejection of at least claim 20 above.

Referring to claim 41, see the rejection of at least claim 21 above.

9. Claims 45, 46, 48, 51, 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Nesbit et al., U.S. Patent No. 5,772,522 ("Nesbit") and Radow, U.S. Patent No. 6,454679 ("Radow"). Note that the Radow reference is being applied in response to the applicant's challenge of the Official Notice taken in the previous Office Action.

Referring to claim 45, Nesbit discloses a body modeling system that includes a user interface for displaying information about movements of a subject, the user interface comprising:

a. an input facility for loading kinetic and kinematic data of a subject (col. 5, line 65-col. 6, line 51)

b. an integrated animation facility for displaying an android whose movements are based on the loaded kinetic and kinematic data of the subject (col. 6, line 53-col. 7, line 40 and figure 8)

c. a plot facility for providing various plots associated with the loaded kinetic and kinematic data (col. 11, lines 10-54 and figures 9-11)

d. a mathematical facility for performing computational analysis on the loaded kinetic and kinematic data (col. 10, line 59-col. 11, line 54).

Nesbit does not disclose expressly that the mathematical facility performs time differentiation and integration utilizing the kinetic and kinematic data. However, the Examiner notes that Nesbit's mathematical facility comprises a computer (figure 1). Furthermore, it was exceedingly well known for computers to perform time differentiation and integration on data. For example, Radow discloses a computer processor that performs time differentiation and integration on data (col. 35, lines 10-26).

Therefore, it would have been obvious to perform time differentiation and integration utilizing the kinetic and kinematic data on the computer of Nesbit. The suggestion/motivation for doing so would have been to provide additional kinematic and kinetic data of the subject, thereby enhancing the analysis of the biomechanics of the subject (Nesbit, col. 10, lines 59-67).

Referring to claim 46, Nesbit further discloses that the integrated animation facility provides a volume region to view the android (col. 5, lines 29-34).

Referring to claim 48, Nesbit further discloses that the mathematical facility performs statistical analysis on the kinetic and kinematic data (col. 11, lines 1-54 and figures 9-11).

Referring to claim 51, Nesbit further discloses that the plot facility provides a form feature for creating a template of plots of any desired kinematic and kinetic data of the subject (col. 11, lines 1-57).

Referring to claim 52, Nesbit further discloses that the plot facility provides a plot page for displaying detailed plots of various elements of the kinetic and kinematic data (figures 10-12).

10. Claim 47 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Nesbit et al., U.S. Patent No. 5,772,522 ("Nesbit"), Radow, U.S. Patent No. 6,454679 ("Radow"), and Buhler et al., U.S. Patent No. 6,326,972 ("Buhler").

Referring to claim 47, Nesbit and Radow do not disclose expressly that the integrated animation facility provides complete control of a model view point from any elevation and azimuth. However, this feature was exceedingly well known in the art. For example, Buhler

discloses an integrated animation facility that provides complete control of a model view point from any elevation and azimuth (col. 7, lines 46-48).

Nesbit, Radow, and Buhler are combinable because they are all concerned with image processing methods. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the integrated animation facility of Nesbit and Radow so that it provides complete control of a model view point from any elevation and azimuth, as taught by Buhler. The suggestion/motivation for doing so would have been to enhance the ability to interactively study the biomechanics of the subject (Nesbit, col. 10, line 59). Therefore, it would have been obvious to combine Nesbit and Radow with Buhler to obtain the invention as specified in claim 47.

11. Claim 50 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Nesbit et al., U.S. Patent No. 5,772,522 ("Nesbit"), Radow, U.S. Patent No. 6,454679 ("Radow"), and Plotke, U.S. Patent No. 5,329,368 ("Plotke"). Note that the Plotke reference is being applied in response to the applicant's challenge of the Official Notice taken in the previous Office Action.

Referring to claim 50, Nesbit does not disclose expressly that the mathematical facility performs digital filtering and Fourier transforms utilizing the kinetic and kinematic data. However, the Examiner notes that Nesbit's mathematical facility comprises a computer (figure 1). Furthermore, it was exceedingly well known for computers to perform digital filtering and Fourier transforms on data. For example, Plotke discloses a processor that performs digital filtering and Fourier transforms on data (col. 2, lines 54-59).

Therefore, it would have been obvious to perform digital filtering and Fourier transforms utilizing the kinetic and kinematic data on the computer of Nesbit. The suggestion/motivation for doing so would have been to provide additional kinematic and kinetic data of the subject, thereby enhancing the analysis of the biomechanics of the subject (Nesbit, col. 10, lines 59-67).

12. Claim 53 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Nesbit et al., U.S. Patent No. 5,772,522 ("Nesbit"), Radow, U.S. Patent No. 6,454679 ("Radow"), and Ueda et al., U.S. Patent No. 4,845,764 ("Ueda"). Note that the Ueda reference is being applied in response to the applicant's challenge of the Official Notice taken in the previous Office Action.

Referring to claim 53, Nesbit further discloses that the plot facility performs various analysis (col. 11, line 1-54), but does not disclose expressly that the plot facility allows zooming of the plots. The Examiner notes that zooming of a plot was exceedingly well known in the art. For example, Ueda discloses a device for zooming a plot (col. 6, lines 18-31 and figures 5b, 6).

Therefore, it would have been obvious to modify Nesbit's plot facility so that it allows zooming of the plots. The suggestion/motivation for doing so would have been to enhance the study of the biomechanics of the subject (Nesbit, col. 10, line 59).

13. Claims 54-56, 67-70, 78-80 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Nesbit et al., U.S. Patent No. 5,772,522 ("Nesbit") and Handelman et al., U.S. Patent No. 6,057,859 ("Handelman").

Referring to claim 54 as best understood, Nesbit discloses a system for modeling a subject to obtain kinematic and dynamic data, the system comprising:

a. an input stage for obtaining image device data associated with at least one body segment representing the subject (col. 5, line 65-col. 6, line 51)

b. an array tracking module for transforming the image device data into position and orientation data of at least one cluster of markers (col. 5, line 65-col. 6, line 51 and col. 7, lines 48-61)

c. a full body modeling module for transforming the position and orientation data of the at least one cluster of markers into position and orientation of the at least one body segment [col. 5, line 66-col. 6, line 9, and col. 7, line 41-col. 8, line 45. Note that the transformed data representing position and orientation data of the at least one cluster of markers will include the transformed data representing position and orientation data of the at least one body segment, since the cluster of markers define the body segment (col. 6, lines 3-9)]

d. a kinematic analysis module for processing configuration data to obtain kinematic data (col. 5, line 65-col. 6, line 51)

e. a kinetic analysis module for processing the configuration data to obtain kinetic data (col. 5, line 65-col. 6, line 51)

f. a user interface for displaying the calculated kinematic and kinetic information of the subject (col. 11, lines 1-54 and figures 10-12).

Nesbit does not explicitly disclose that quaternions are used to describe position and orientation data of at least one cluster of markers. However, this feature was exceedingly well

known in the art. For example, Handelman discloses quaternions that are utilized to describe position and orientation of at least one body segment (col. 21, lines 13-20).

Nesbit and Handelman are combinable because they are both concerned with determining kinematic and kinetic data of a human subject. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the array tracking module of Nesbit so that it uses quaternions to describe position and orientation of each of the at least one cluster of markers, as taught by Handelman. The suggestion/motivation for doing so would have been to compute kinematic problems in real time, while producing human limb movements that appears natural and realistic to the viewer (Handelman, col. 3, lines 24-35). Therefore, it would have been obvious to combine Nesbit with Handelman to obtain the invention as specified in claim 54.

Referring to claim 55, Nesbit further discloses that the position and orientation data of the at least one body segment is initially determined by a pointer (golf club) [col. 8, lines 60-62].

Referring to claim 56, Nesbit further discloses that the pointer includes a set of markers on a rigid plate (col. 6, lines 7-9).

Referring to claim 67, see the rejection of at least claim 54 above.

Referring to claim 68, Nesbit further discloses that the image device data is obtained using more than one image device (col. 5, line 66-col. 6, line 2).

Referring to claim 69, see the rejection of at least claim 55 above.

Referring to claim 70, see the rejection of at least claim 56 above.

Referring to claims 78-80, see the discussion of at least claim 45 above.

14. Claims 60 and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Nesbit et al., U.S. Patent No. 5,772,522 ("Nesbit"), Handelman et al., U.S. Patent No. 6,057,859 ("Handelman"), and the text book entitled "FUNDAMENTALS OF PHYSICS" by Halliday et al. ("Halliday").

Referring to claim 60, Nesbit further discloses that Newton's Law is used to calculate motion and force parameters for the subject (col. 7, lines 11-21). However, Nesbit and Handelman do not disclose expressly that the linear and angular momenta associated with the head, arm, trunk, foot, shank, thigh, and pelvis of the subject are computed.

Halliday discloses that the linear and angular momenta were commonly known mathematical expressions based on Newton's Law that represent the force and motion of an object (page 278-279, section 12-5).

Nesbit, Handelman, and Halliday are combinable because they are all concerned with determining kinematic and kinetic data of an object. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the processing step of Nesbit and Handelman, so that the linear and angular momenta associated with the head, arm, trunk, foot, shank, thigh, and pelvis of the subject are computed, as taught by Halliday. The suggestion/motivation for doing so would have been to provide additional kinematic/kinetic information corresponding to the object such that an accurate motion analysis can be obtained. Therefore, it would have been obvious to combine Nesbit and Handelman with Halliday to obtain the invention as specified in claim 60.

Referring to claim 74, see the rejection of at least claim 60 above.

Conclusion

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles Kim whose telephone number is 703-306-4038. The examiner can normally be reached on Mon thru Thurs 8:30am to 6pm and alternating Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on 703-308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ck
March 9, 2005

Jon Chang
Primary Examiner